Evaluating Electricity System Needs in 2030

IEPR Lead Commissioner Workshop on Evaluation of Electricity System Needs in 2030

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Evaluating Electricity Sector Needs in 2030

•Given trends in resource development and policies being implemented (or proposed) in the electricity sector, what are the questions/issues regarding the medium-term (2020 – 2030) that studies should address?

•Are there specific 2030 scenarios that should be investigated to better understand the assumptions implicit in and risks associated with future choices?

•What are reasonable ranges for 2030 values of key variables needed for electricity sector modeling (demand, resource cost, availability and performance) ?

2050 GHG Reduction Goals

Substantially reducing GHG emissions from the electricity requires decarbonization through some combination of

- Increased energy efficiency savings/conservation;
- development of new zero and low-carbon technologies;
- nuclear generation;
- continued deployment of conventional renewable technologies

New Zero- and Low-Carbon and Nuclear Generation Technologies

- Can they be assumed to be deployed on a widespread basis by 2030?

  - Coal combustion with CCUS remains very high cost and faces opposition from stakeholders. Natural gas with CCUS is cheaper but may face similar opposition.

  - Nuclear plant development in California is currently precluded by statute, faces long lead times for development and faces strong public opposition

  - Advanced biofuel deployment limited by feedstock availability, long-run competition from the transportation sector

Current View of 2022 - 2024

- Energy Commission CED 2013 demand forecast

- Planning Assumptions developed in CPUC 2012 LTPP proceeding
  - Retirements
  - Energy efficiency and demand response targets
  - Renewable portfolios

- CA ISO studies submitted to the LTPP
  - (Replacement) capacity needs in Los Angeles and San Diego
  - Operational flexibility needs

- POU demand and supply filings in 2013 IEPR

Projected RPS Additions
2013 - 2022

Technology	Projected Annual Energy (GWh)			Nameplate Capacity (MW)
	In-State	Out-of-State	Total	
Solar	18,843	1,633	20,476	9,115
Wind	4,481	1,496	5,977	2,149
Geothermal	3,766	1,200	4,965	688
Biofuels	1,377	0	1,377	193
Small Hydro	0	0	0	0
Total	28,468	4,328	32,796	12,144

Source: California ISO

Net Load Curve Using Shapes of 3/22/2013 for ISO RPS Projections to Year 2017

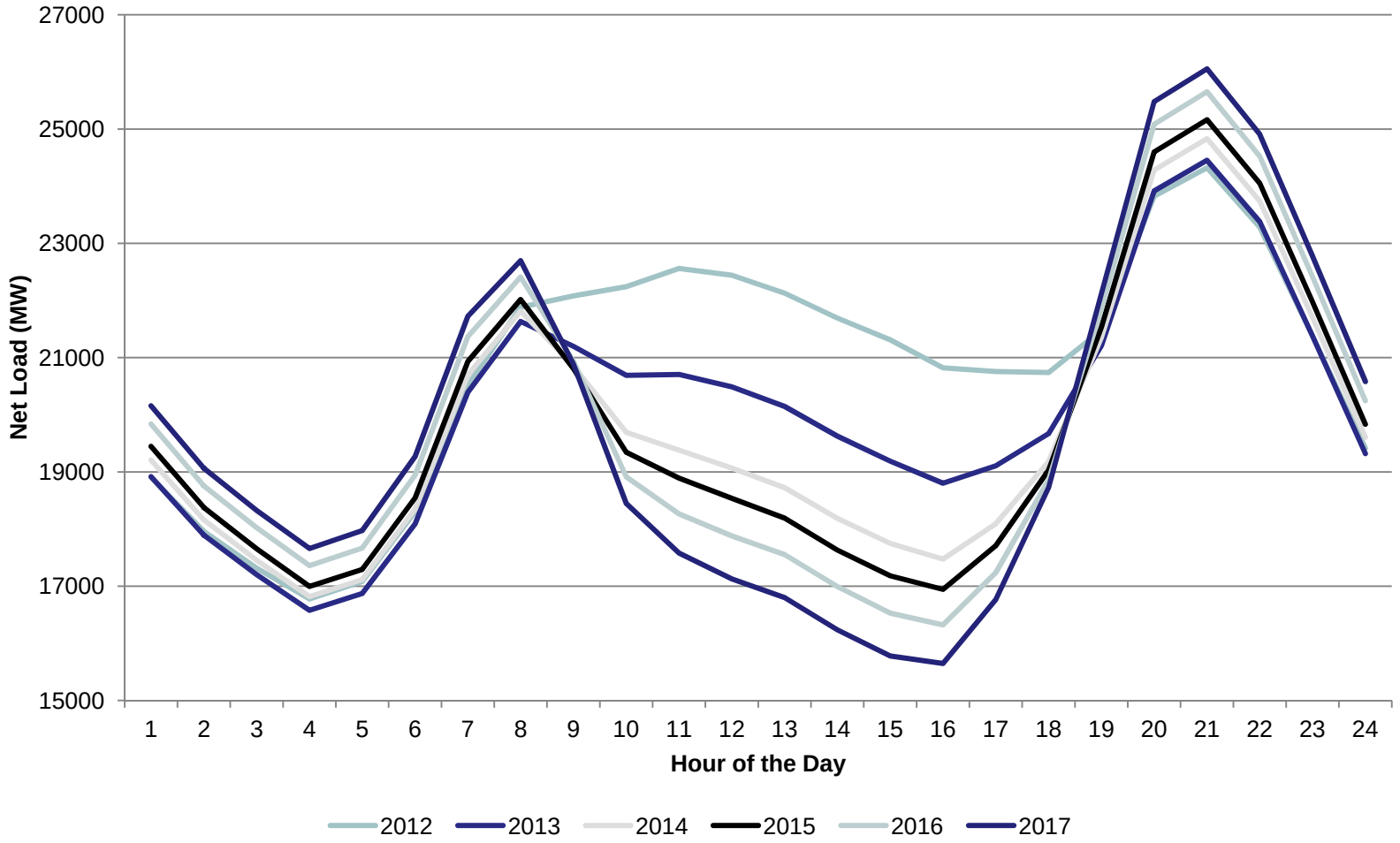
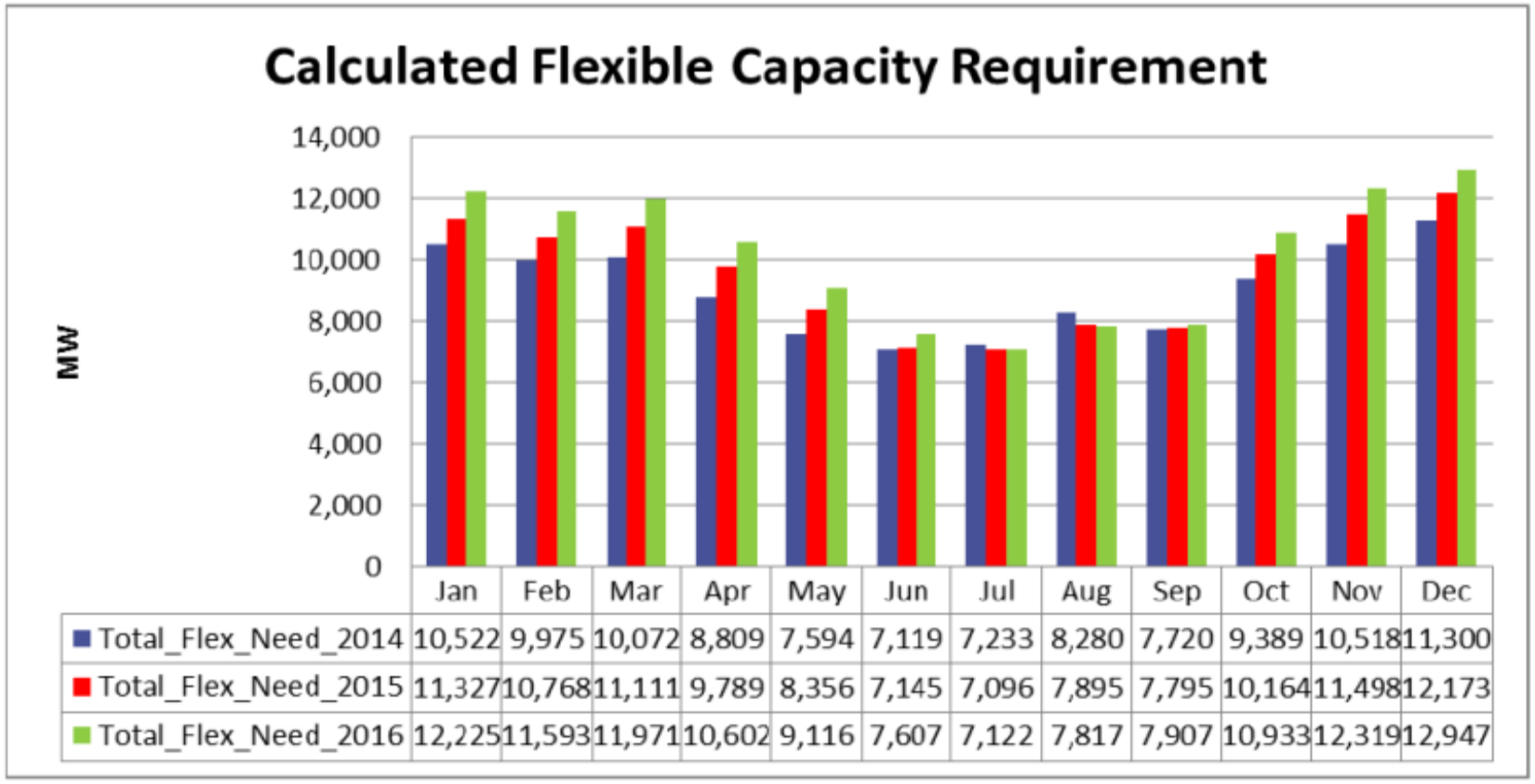


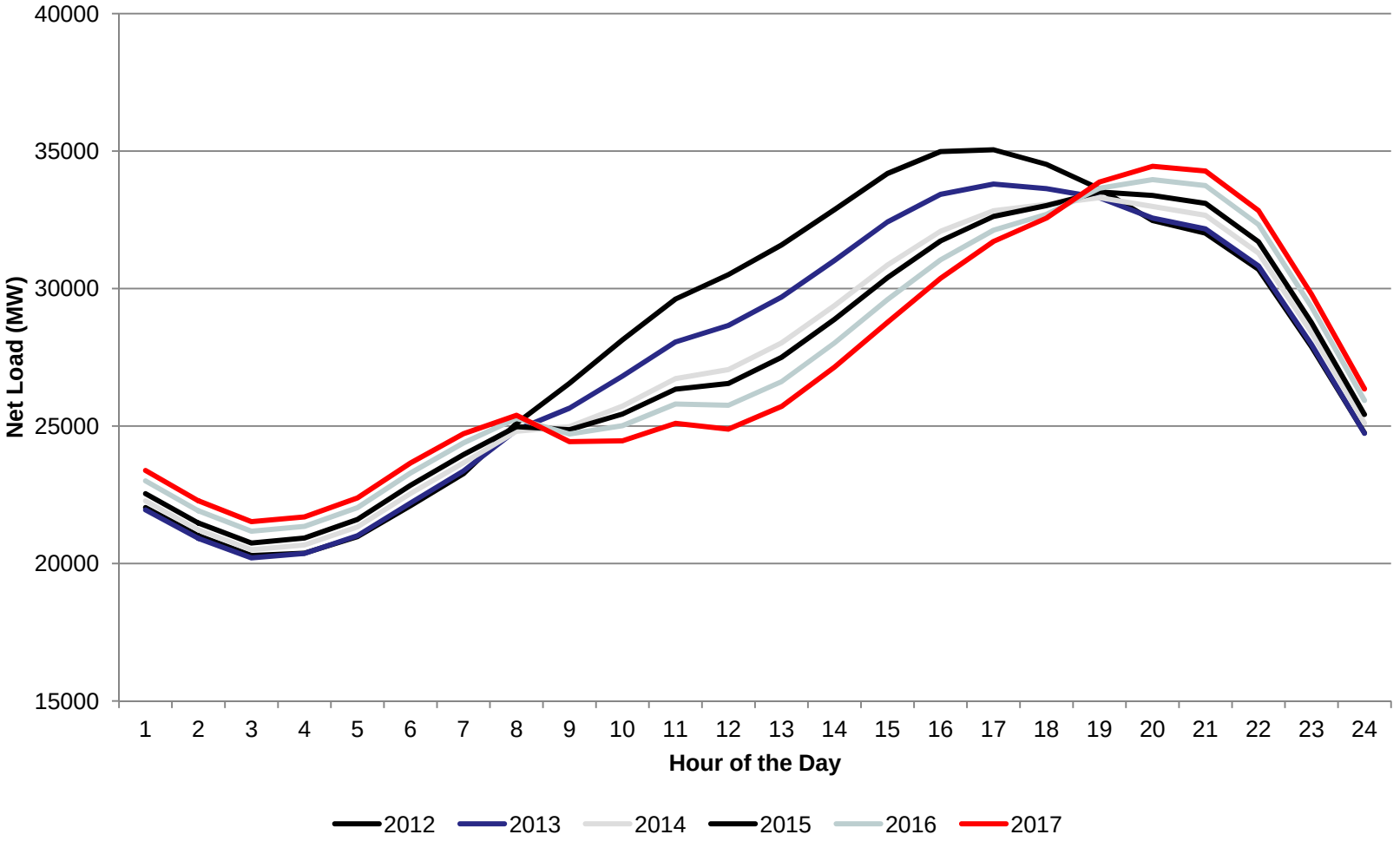
Figure 3: Forecasted Flexible Capacity Requirement 2014-2016



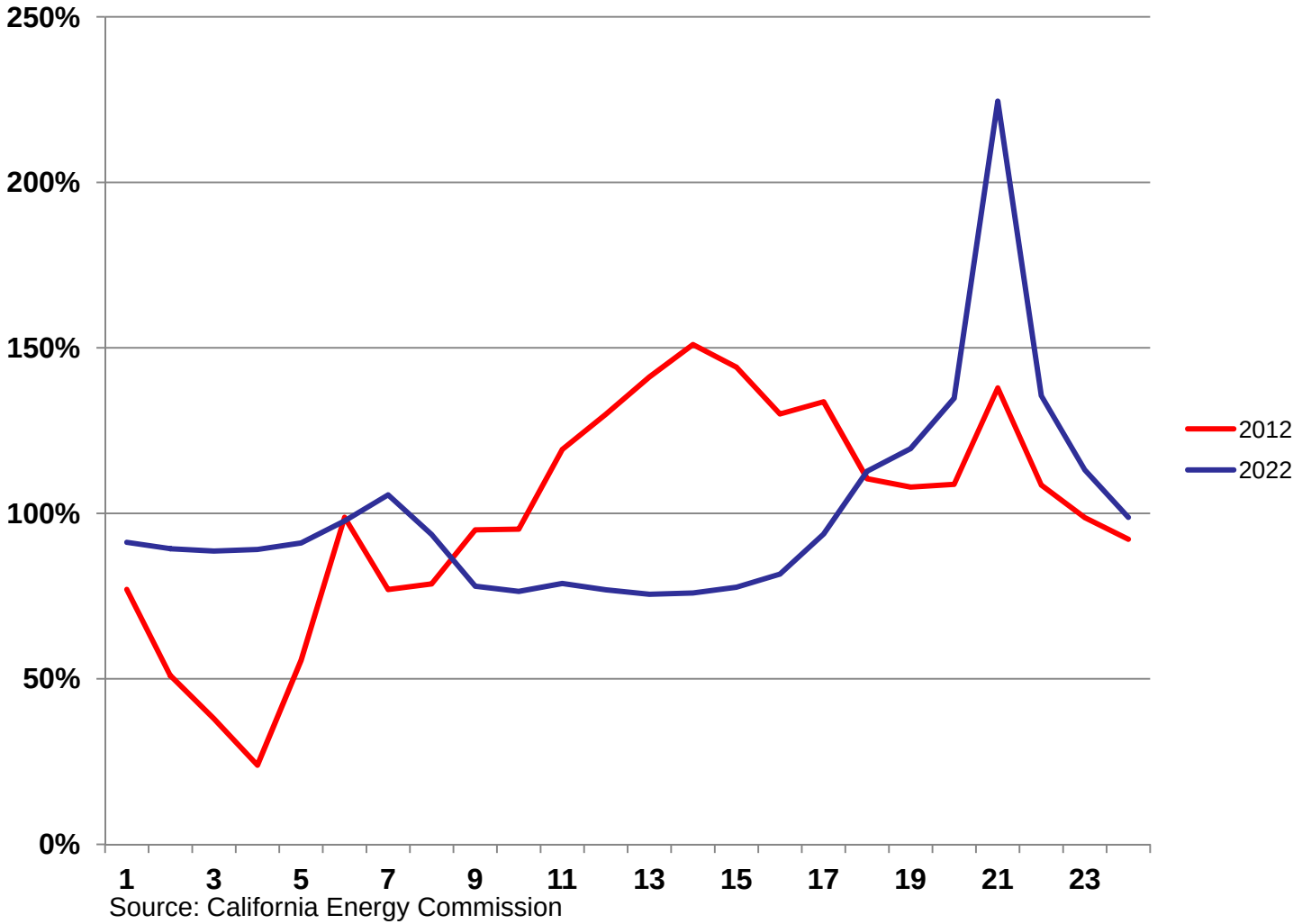
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total_Flex_Need_2014	10,522	9,975	10,072	8,809	7,594	7,119	7,233	8,280	7,720	9,389	10,518	11,300
Total_Flex_Need_2015	11,327	10,768	11,111	9,789	8,356	7,145	7,096	7,895	7,795	10,164	11,498	12,173
Total_Flex_Need_2016	12,225	11,593	11,971	10,602	9,116	7,607	7,122	7,817	7,907	10,933	12,319	12,947

Source: California Independent System Operator

Net Load Curves Using Shapes for 7/18/2013 for ISO RPS Projections to Year 2017



Average Hourly Normalized Prices
April 2012 and April 2022



Source: California Energy Commission

Intermittent Resources and Planning

Widespread deployment of intermittent resources has implications for modeling of/planning for electricity system and assessing reliability risk.

- Stochastic modeling needed to measure the reliability of a portfolio of resources
- Interrelationships between loads, weather and intermittent output need to be accurately specified
- To date, limited amount of actual output data available; simulated data is for limited periods. Output data needs to have shorter time-step as sub-hourly fluctuations are important.
- Difficult to gather accurate data on distribution-level, customer-side-of-the-meter resources

Intermittent Resources and Operations

Challenges Created

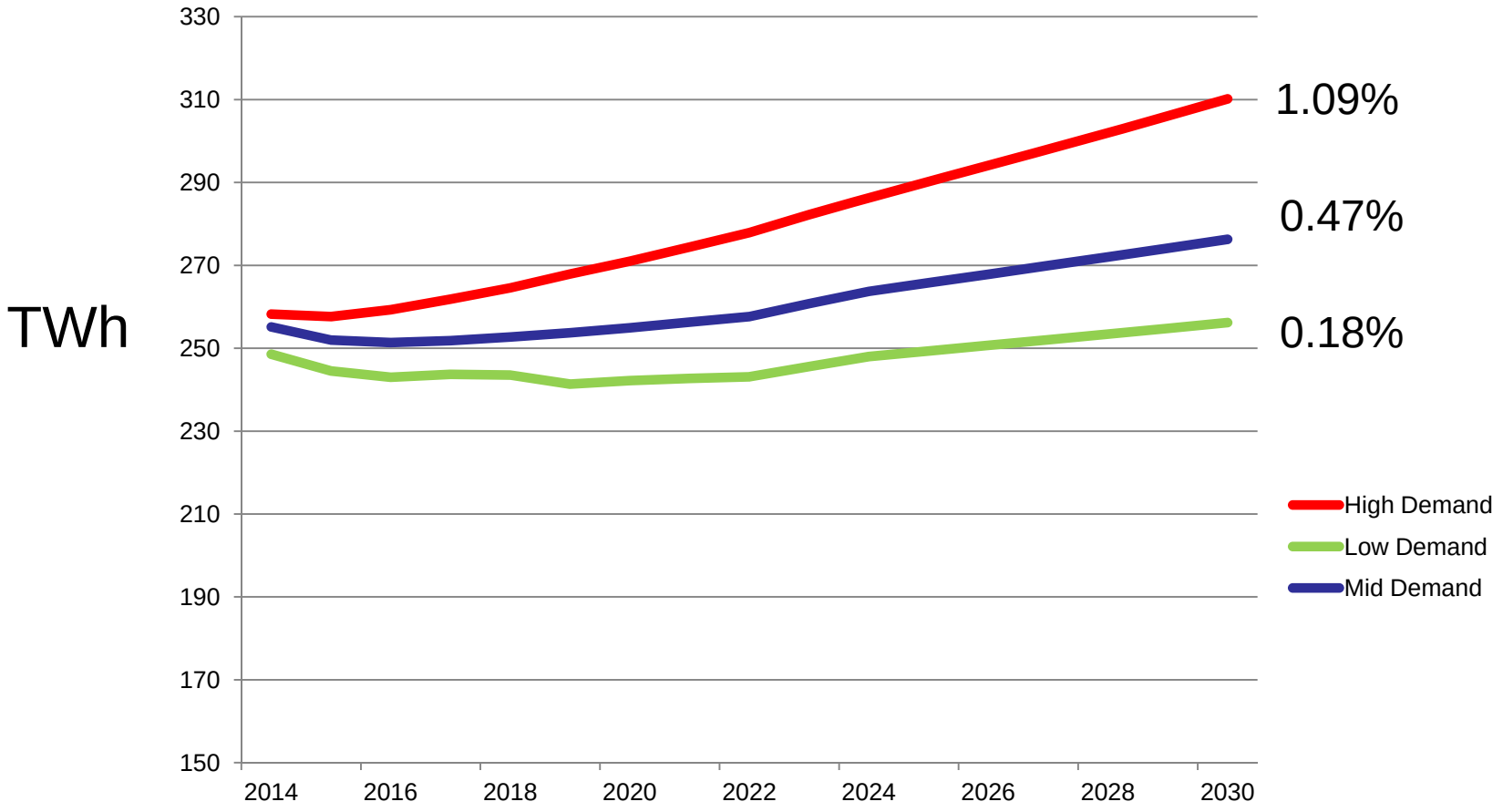
•Need for higher reserves to handle variation in output
•Need for greater quantity of flexible resources that can be dispatched by the operator to meet higher ramps

Responses

•Improved forecasting of intermittent output
•More frequent scheduling of resources
•Create regional markets for imbalance energy
•Facilitate participation of demand-side resources in load-following markets
•Develop Storage

Uncertainty: Load Growth and Energy Efficiency

Statewide RPS –Eligible Retail sales



Uncertainty: Supply

- Will Diablo Canyon be relicensed? What will Intermountain be replaced with?
- How much multi-hour storage will be available at a competitive price?
- How much event-triggered demand response will be available?
- How much dispatchable (RPS-eligible) biomethane can be developed ?
- How much natural gas with CCUS might be developed by 2030?

Incremental Renewable Energy Needs in 2030 by RPS Level (TWh)

Year/RPS Target	Low Case	Mid Case	High Case
2020 / 33%	84.13	84.13	84.13
2030 / 33%	0.42	7.05	18.23
2030 / 40%	18.35	**26.39**	39.94
2030 / 50%	43.97	54.02	70.95

Source: California Energy Commission

26.39 TWh of Energy

Technology	Capacity Factor	Required MW
Distributed Solar	24%	12,552
Central Station Solar	28%	10,759
Wind	32%	9,414
Geothermal	80%	3,765
Biofuels	85%	3,545

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